**Part 68 of the FCC Rules**

**(As amended February 13, 1976, March 12, 1976, March 18, 1976, July 12, 1976, October 5, 1976 and December 14, 1976)**

# CONNECTION OF TERMINAL EQUIPMENT TO THE TELEPHONE NETWORK

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## Part 68 of the FCC Rules

CONNECTION OF TERMINAL EQUIPMENT
TO THE TELEPHONE NETWORK

SUBPART A—GENERAL

Section 68.1 *Purpose*

The purpose of the rules and regulations in this Part is to provide for uniform standards for the protection of the telephone network from harms caused by the connection of terminal equipment thereto.

Section 68.2 *Scope*

(a) Except as provided for in paragraphs (b) and (c), the rules and regulations in this Part apply to the direct connection after May 1, 1976 of all terminal equipment other than coin telephones, and PBX and key telephone equipment to the telephone network, for use in conjunction with all services other than party line service, and to the direct connection after August 1, 1976 of all terminal equipment other than coin telephones to the telephone network, for use in conjunction with all services other than party line service.

(b) Unless otherwise ordered by the Commission, all items of equipment, other than PBX and key telephone equipment, of a type directly connected to the network as of May 1, 1976 may be connected thereafter up to June 1, 1977—and may remain connected for life—without registration, unless subsequently modified.

(c) Unless otherwise ordered by the Commission, all PBX and key telephone equipment of a type directly connected to the network as of August 1, 1976 may be connected thereafter up to June 1, 1977—and may remain connected for life—without registration, unless subsequently modified.

Section 68.3 *Definitions*

As used in this part:

Direct Connection: Connection of terminal equipment to the telephone network by means other than acoustic and/or inductive coupling.

Harm: Electrical hazards to telephone company personnel, damage to telephone company equipment, malfunction of telephone company billing equipment, and degradation of service to persons other than the user of the subject terminal equipment, his calling or called party.

Interface: The point of interconnection between terminal equipment and telephone company communication facilities.

Longitudinal Voltage: One half the sum of the potential difference between the tip connection and earth ground, and the ring connection and earth ground.

Loop Simulator Circuit: A source of dc power and a load impedance for connection, in lieu of a telephone loop, to terminal equipment during testing. Figure 68.3 is a schematic drawing of the loop simulator. When used, the simulator shall be operated over the entire range of loop resistance as is indicated on the Figure, and with the indicated polarities and voltage limits. Whenever loop current is changed, sufficient time shall be allocated for the current to reach a steady-state condition before continuing testing.

Metallic Voltage: The potential difference between the tip and ring connections.

Multi-Port Equipment: Equipment that has more than one telephone connection with provisions internal to the equipment for establishing transmission paths among two or more telephone connections.

One-Port Equipment: Equipment which has either exactly one telephone connection, or a multiplicity of telephone

connections arranged so that no transmission among such telephone connections, within the equipment is intended.

Power Connections: The connections between commercial power and any transformer, power supply rectifier, converter or other circuitry associated with registered terminal equipment or registered protective circuitry. The following are not power connections:

(a) connections between registered terminal equipment or registered protective circuitry and sources of non-hazardous voltages.

(b) conductors which distribute any power within registered terminal equipment or within registered protective circuitry.

(c) green wire ground (the grounded conductor commercial power circuit which is UL-identified by a continuous green color).

Registered Protective Circuitry: Separate, identifiable and discrete electrical circuitry designed to protect the telephone network from harm, which is registered in accordance with the rules and regulations in Subpart C of this part.

Registered Terminal Equipment: Terminal equipment which is registered in accordance with the rules and regulations in Subpart C of this part.

Telephone Connection: Connection to telephone tip and ring and all connections derived from telephone tip and ring. The term "derived" as used here means that the connections are not separated from telephone tip and ring by a sufficiently protective dielectric barrier.

Telephone Network: The public switched telephone network.

[Figure 68.3 Is Omitted In This Appendix]

## Subpart B—Conditions on Use of Terminal Equipment

### Section 68.100 *General*

Terminal equipment may be directly connected to the telephone network in accordance with the rules and regulations in Subpart B of this Part.

### Section 68.102 *Registration Requirement*

Terminal equipment must be registered in accordance with the rules and regulations in Subpart C of this Part, or connected through registered protective circuitry, which is registered in accordance with the rules and regulations in Subpart C of this Part.

### Section 68.104 *Means of Connection*

(a) General

Except for telephone company-provided ringers and except as provided in subsection (c), all connections to the telephone network shall be made through the standard plugs and standard telephone company-provided jacks, or equivalent, described in Subpart F, in such a manner as to allow for easy and immediate disconnection of the terminal equipment. Standard jacks shall be so arranged that, if the plug connected thereto is withdrawn, no interference to the operation of equipment at the customer's premises which remains connected to the telephone network, shall occur by reason of such withdrawal.

(b) Data Equipment

Where a customer desires to connect data equipment which has been registered in accordance with Section 68.308(a)(4)(i) or (ii), he shall notify the telephone company of each telephone line to which he intends to connect such equipment. The telephone company, after determining the attenuation of each such telephone line between the interface and the telephone company central office, will make such connections as

are necessary in each standard data jack which it will install, so as to allow the maximum signal power delivered by such data equipment to the telephone company central office to reach but not exceed the maximum allowable signal power permitted at the telephone company central office.

(c) [Reserved]

Section 68.106 *Notification to Telephone Company*

Customers connecting terminal equipment to the telephone network shall, before such connection is made, give notice to the telephone company of the particular line(s) to which such connection is to be made and shall provide to the telephone company the F.C.C. Registration Number and the Ringer Equivalence Number of the registered terminal equipment or registered protective circuitry.

Section 68.108 *Incidence of Harm*

Should terminal equipment cause harm to the telephone network, the telephone company shall, where practicable, notify the customer that temporary discontinuance of service may be required; however, where prior notice is not practicable, the telephone company may temporarily discontinue service forthwith, if such action is reasonable in the circumstances. In case of such temporary discontinuance, the telephone company shall (1) promptly notify the customer of such temporary discontinuance, (2) afford the customer the opportunity to correct the situation which gave rise to the temporary discontinuance, and (3) inform the customer of his right to bring a complaint to the Commission pursuant to the procedures set out in Subpart E of this Part.

Section 68.110 *Compatibility of the Telephone Network and Terminal Equipment*

(a) Availability of Interface Information

Technical information concerning interface parameters not specified in this Part, including the number

of ringers which may be connected to a particular telephone line, which is needed to permit terminal equipment to operate in a manner compatible with telephone company communications facilities, shall be provided by the telephone company upon request.

(b) Changes in Telephone Company Facilities, Equipment, Operations or Procedures

The telephone company may make changes in its communications facilities, equipment, operations or procedures, where such action is reasonably required in the operation of its business and is not inconsistent with the rules and regulations in this Part. If such changes can be reasonably expected to render any customer's terminal equipment incompatible with telephone company communications facilities, or require modification or alteration of such terminal equipment, or otherwise materially affect its use or performance, the customer shall be given adequate notice in writing, to allow the customer an opportunity to maintain uninterrupted service.

SUBPART C—REGISTRATION PROCEDURES

Section 68.200 *Application for Equipment Registration*

An original and two copies of an application for registration of terminal equipment and protective circuitry shall be submitted on FCC Form 730 to the Federal Communications Commission, Washington, D.C. 20554. An application for original approval of an equipment type directly connected to the network on May 1, 1976 may be submitted as a short form application (unless the Commission specifically requests the filing of complete information). All other applications shall have all questions on the form answered and include the following information:

(a) Identification, technical description and purpose of the equipment for which registration is sought.

(b) The means, if any, employed to limit signal power into interface.

(c) A description of all circuitry employed in assuring compliance with Part 68 including the following:

(1) Specifications, including voltage or current ratings, of all circuit elements, whether active or passive, in that part of the device which provides the isolation means at the interface.

(2) A circuit diagram containing the complete circuit of that part of the device which provides the isolation means at the interface. If this portion of the device is subject to factory or field adjustment by the manufacturer's service agency, instructions for these adjustments shall be included. In addition, if the device is designed to operate from power supplied by electric utility lines, the circuit diagram shall also include that portion of the device connected to such lines, including the power supply to the internal circuits and whatever means are employed to isolate such utility lines, from the internal circuits.

(3) If a service manual is submitted, and any of these items are covered therein, it will be sufficient to list the pages in the manual on which the information specified in the item(s) appear.

(d) A statement that the terminal equipment or protective circuitry complies with and will continue to comply with the rules and regulations in Subpart D of this Part, accompanied by such test results, description of test procedures, analyses, evaluations, quality control standards and quality assurance standards as are necessary to demonstrate that such terminal equipment or protective circuitry complies with and will continue to comply with all the rules and regulations in Subpart D of this Part. The Office of Chief

Engineer may issue an OCE Bulletin describing acceptable test methods; other test methods may be employed provided they are fully described in the application and are found acceptable by the Commission.

(e) A photograph, sample, or drawing of the equipment label showing the information to be placed thereon.

(f) Photographs, 8" x 10" of the equipment of sufficient clarity to reveal equipment construction and layout and labels for controls, with sufficient views of the internal construction to define component placement and chassis assembly. Photographs smaller than 8" x 10" will be acceptable if mounted on paper 8" x 10" and of sufficient clarity for the purpose. Insofar as these requirements are met by photographs or drawings contained in service manual or instruction manual included with the application, additional photographs are required only to complete the required showing.

(g) If the device covered by the application is designed to operate in conjunction with other terminal devices, to couple their signals from or to the interface, the application shall list the class(es) of such other devices, together with their pertinent specification details.

Section 68.202 *Public Notice*

(a) The Commission will issue public notices of the filing of applications for equipment registration and the grants thereof. No grant will issue before 20 days from the date of the public notice of the filing of the application.

(b) The Commission will maintain lists of equipment for which it has granted registration and for which it has revoked registration.

Section 68.204 *Comments and Replies*

Comments may be filed as to any application for equipment registration within 20 days of the date of the public notice of its filing. Replies to such comments may be filed within 10 days of the date of filing of such comments. All comments must be served on the applicant and all replies must be served on all parties filing comments. An original and three copies of all comments and replies must be filed.

Section 68.206 *Grant of Application*

(a) The Commission will grant an application for equipment registration if it finds from an examination of such application and other matter which it may officially notice, that the equipment will comply with the rules and regulations in Subpart D of this Part, or that such grant will otherwise serve the public interest.

(b) Grants will be made in writing showing the effective date of the grant and any special condition(s) attaching to the grant.

(c) Equipment registration shall not attach to any equipment, nor shall any equipment registration be deemed effective, until the application has been granted.

Section 68.208 *Dismissal and Return of Application*

(a) An application which is not filed in accordance with the requirements of this Part or which is defective with respect to completeness of answers to questions, execution or other matters of a formal character, may not be accepted for filing by the Commission and may be returned as unacceptable for filing unless accompanied by a fully supported request for waiver.

(b) Any application, upon written request, may be dismissed prior to a determination granting or denying the equipment registration requested.

(c) If an applicant is requested by the Commission to furnish any additional documents, information or equipment not specifically required by this Subpart, a failure to comply with the request within the time, if any, specified by the Commission will result in the dismissal of such application.

Section 68.210 *Denial of Application*

If the Commission is unable to make the finding specified in Section 68.206 it will deny the application. Notification of the denial will include a statement of the reasons for the denial.

Section 68.212 *Assignment of Equipment Registration*

Commission equipment registration may not be assigned, exchanged or in any other way transferred to another party, without prior written notice to the Commission.

Section 68.214 *Changes in Registered Terminal Equipment and Registered Protective Circuitry*

No changes in registered terminal equipment and registered protective circuitry shall be made without prior written notice to the Commission. If such change in registered terminal equipment or registered protective circuitry results in any change in the information furnished the Commission pursuant to Section 68.200, the grantee shall submit a revised application for equipment registration in accordance with Section 68.200.

Section 68.216 *Repair of Registered Terminal Equipment and Registered Protective Circuitry*

Repair of registered terminal equipment and registered protective circuitry shall be accomplished only by the manufacturer or assembler thereof or by their authorized agent; however, routine repairs may be performed by a user, in accordance with the instruction manual if the applicant certifies that such routine repairs will not result in noncompliance with the rules and regulations in Subpart D of this Part.

Section 68.218 *Responsibility of Grantee of Equipment Registration*

(a) In applying for a grant of an equipment registration, the grantee warrants that each unit of equipment marketed under such grant will comply with all the applicable rules and regulations in Subpart D of this Part.

(b) The grantee or its agent shall provide to the user of the registered equipment the following:

(1) Instructions concerning installation, operational and repair procedures, where applicable.

(2) Instructions that registered terminal equipment or protective circuitry may not be used with party lines or coin lines.

(3) Instructions that when trouble is experienced the customer shall disconnect the registered equipment from the telephone line to determine if the registered equipment is malfunctioning and that if the registered equipment is determined to be malfunctioning, the use of such equipment shall be discontinued until the problem has been corrected.

(4) Instructions that the user must give notice to the telephone company in accordance with the requirements of Section 68.106.

(c) When registration is revoked for any item of equipment, the grantee is responsible to take all reasonable steps to ensure that purchasers and users of such equipment are notified of such revocation and are notified to discontinue use of such equipment.

Section 68.220 *Cross Reference*

Applications for registration of terminal equipment shall, in addition to the requirements of this Subpart, comply with the provisions of Subpart L of Part 2 of this Chapter.

Subpart D is amended as follows:

SUBPART D—CONDITIONS FOR REGISTRATION

Section 68.300 *Labelling Requirements*

(a) Registered terminal equipment and registered protective circuitry shall have prominently displayed on an outside surface the following information in the following format:

| Complies With Part 68, FCC Rules |
| --- |
| FCC Registration Number ..... |
| Ringer Equivalence ..... |

(b) Registered terminal equipment and registered protective circuitry shall also have the following identifying information permanently affixed thereto:

(1) Grantee's name

(2) Model number, as specified in the registration application

(3) Serial number or date of manufacture

Section 68.302 *Environment Simulation*

Registered terminal equipment and registered protective circuitry shall comply with all the criteria contained in the rules and regulations in this Subpart, both prior to and after the application of each of the mechanical and electrical stresses specified in this section, not withstanding that certain of these stresses may result in partial or total destruction of equipment.

(a) Vibration

The equipment shall be subjected to vibration while in the condition that it is normally shipped or transported. That is, during the following vibration test the equipment shall be vibrated while packaged if

shipped packaged, or the equipment shall be vibrated while unpackaged if shipped unpackaged.

The following sinusoidal vibration should be applied once in each of three orthogonal directions, however, for large equipments, the unit should rest on the base or side on which it is normally shipped: One sweep at a level of 0.5g peak from 5 to 100 Hz, and one sweep at a level of 1.5g peak from 100 to 500 Hz. The 5 to 100 Hz sweep should be conducted at a sweep rate of 0.1 octave/min. (approximately 45 minutes) and the 100 to 500 Hz sweep at a rate of 0.25 octave/min. (approximately 10 minutes).

(b) Temperature and Humidity

Cycling at any convenient rate through the following temperature and humidity conditions three times: 30 minutes at 150°F and 15 percent relative humidity, followed by 30 minutes at 90°F and 90 percent relative humidity, followed by 30 minutes at −40°F and any convenient humidity.

(c) Shock:

(1) Registered Terminal Equipment and Registered Protective Circuitry Packaged for Shipment:

These tests are to be performed on a concrete surface with one package and its normal contents. If after six or more successive drops a package has sustained visible damage, the equipment under test may be repackaged before the packaged drop tests are resumed.

0-20 lbs:

One 30-inch face drop on each face and one 30-inch corner drop on each corner.

20-50 lbs:

One 24-inch face drop on each face and one 24-inch corner drop on each corner.

50-100 lbs:

One 21-inch face drop on each face and one 21-inch corner drop on each corner.

100-200 lbs:

One 18-inch face drop on each normal or designated rest face. One edgewise drop and one cornerwise drop from a height of 18 inches on each edge and corner adjacent to the rest face.

200-600 lbs:

One 12-inch face drop on each normal or designated rest face. One edgewise drop and one cornerwise drop from a height of 12 inches on each edge and corner adjacent to the rest face.

600-1000 lbs:

One 8-inch face drop on each normal or designated rest face. One edgewise drop and one cornerwise drop from a height of 8 inches on each edge and corner adjacent to the rest face.

Over 1000 lbs:

One 6-inch face drop on each normal or designated rest face. One edgewise drop from a height of 6 inches on each edge adjacent to the rest face.

(2) Registered Terminal Equipment and Registered Protective Circuitry Equipment Unpackaged:

Hand-Held Items Normally Used at Head Height:

18 random drops from a height of 60 inches onto concrete covered with ⅛ inch asphalt tile or similar surface.

Normally Customer Carried Equipment:

6 random drops from a height of 30 inches onto concrete covered with ⅛ inch asphalt tile or similar surface.

Equipment Not Normally Customer Carried:

These tests are made onto concrete covered with ⅛ inch asphalt tile or similar surface.

0-20 lbs:

One 6-inch face drop on each normal or designated rest face, one 3-inch drop on all other faces, and one 3-inch corner drop on each corner.

20-50 lbs:

One 4-inch face drop on each normal or designated rest face, one 2-inch face drop on all other faces, and one 2-inch corner drop on each corner.

50-100 lbs:

One 2-inch face drop on each normal or designated rest face. One edgewise drop and one cornerwise drop from a height of 2 inches on each edge and corner adjacent to the rest face.

100-1000 lbs:

One 1-inch face drop on each normal or designated rest face. One edgewise drop and one cornerwise drop from a height of 1 inch on each edge and corner adjacent to the rest face.

Over 1000 lbs:

One 1-inch face drop on each normal or designated rest face. One edgewise drop from a height of 1 inch on each edge adjacent to this rest face.

(3) The drop tests specified in the mechanical shock conditioning stresses shall be performed as follows:

Face Drop

The unit should be dropped such that the face to be struck is approximately parallel to the impact surface.

CORNER DROP

The unit should be dropped such that upon impact a line from the struck corner to the center of gravity of the packaged equipment is approximately perpendicular to the impact surface.

EDGEWISE DROP

The unit should be positioned on a flat test surface. One edge of the rest face should be supported with a block so that the rest face makes an angle of 20° with the horizontal. The opposite edge should be lifted the designated height above the test surface and dropped.

CORNERWISE DROP

The unit should be positioned on a flat test surface. One corner of the test face should be supported with a block so that the rest face makes an angle of 20° with the horizontal. The opposite corner should be lifted the designated height above the test surface and dropped.

RANDOM DROP

The unit should be positioned prior to release to ensure as nearly as possible that for every six drops there is one impact on each of the six major surfaces and that the surface to be struck is approximately parallel to the impact surface.

(d) Metallic voltage surge

Two 800-volt peak surges of a metallic voltage (one of each polarity) having a 10-microsecond *maximum* rise time to crest and a 560-microsecond *minimum* decay time to half crest applied between tip and ring and between any other pair of connections on which lightning surges may occur (with one of the connections of the pair under test grounded) with the equipment in each of the following states:

(1) any operational state which can affect compliance with the requirements of Part 68;

(2) any state in which the equipment might be connected to the telephone network and from which it is capable of transferring to an operational state by an automatic or manual action required for proper use of the equipment and provided that any such state can affect compliance with the requirements of Part 68; and

(3) any state in which the equipment might be connected to the telephone network through an automatic or manual action under all reasonably foreseeable possibilities of disconnection of connections of such equipment with primary commercial power sources (including possible loss of equipment grounding through disconnection of a third-wire ground connection contained in a primary power source plug).

During application of the surges, equipment states which cannot be achieved by normal means of power shall be achieved artificially by appropriate means, if necessary to comply with the above requirements. The peak current drawn from the surge generator must not be limited to less than 100 amperes by the capabilities of the surge generator.

(e) Longitudinal voltage surge

With registered terminal equipment and registered protective circuitry in each of the following states: *first*, any operational state which can affect compliance with the requirements of Part 68; *second*, any state in which the equipment might be connected to the telephone network and from which it is capable of transferring to an operational state by an automatic or manual action required for proper use of the equipment and provided that any such state can affect compliance with the requirements of Part 68;

and *third*, any state in which the equipment might be connected to the telephone network through an automatic or manual action under all reasonably foreseeable possibilities of disconnection of connections of such equipment with primary commercial power sources (including possible loss of equipment grounding through disconnection of a third-wire ground connection contained in a primary power source plug):

(1) Two 1500 volt peak surges (one of each polarity) having a 10 microsecond *maximum* rise time to crest and a 160 microsecond *minimum* decay time to half crest applied between tip and ring connected together, and individually to (i) and (ii) below:

(i) earth ground; and

(ii) all leads on the registered equipment intended for connection to nonregistered equipment when these leads are connected together.

The peak current drawn from the surge generator must not be limited to less than 200 amperes by the capabilities of the surge generator.

(2) Two 1500 volt peak surges (one of each polarity) having a 10 microsecond *maximum* rise time to crest and a 160 microsecond *minimum* decay time to half crest applied between pairs of connections other than tip and ring on which lightning surges may occur, connected together, and individually to (i) and (ii) below:

(i) earth ground; and

(ii) all leads on the registered equipment intended for connection to nonregistered equipment when these leads are tied together.

The peak current drawn from the surge generator shall not be limited to less than 200 amperes by the capabilities of the surge generator.

(3) Six 2500 volt peak surges (three of each polarity) having a 2 microsecond *maximum* rise time to crest and a 10 microsecond *minimum* decay time to half crest applied between the phase and neutral terminals of the ac power line. The peak current drawn from the surge generator must not be limited to less than 1000 amperes by the capabilities of the surge generator.

Section 68.304 *Leakage Current Limitations*

Registered terminal equipment and registered protective circuitry shall assure that, if a voltage source is connected to the combinations listed in the table below, of the following points on such equipment:

(1) all telephone connections,

(2) all power connections,

(3) all possible combinations of exposed conductive surfaces on the exterior of such equipment or circuitry excluding terminals for connection to other terminal equipment,

(4) all terminals for connection to nonregistered equipment, and

(5) points having a conducting path to the secondaries of any power supply

and is gradually increased, from zero to the values listed in the table below, over a thirty second time period, and then applied continuously for one minute, the current in the mesh formed by the voltage source and these points shall not exceed 10 milliamperes peak at any time during this 90 second time interval.

*Voltages Applied for Various Combinations of Electrical Connections*

| Voltage Source Connected Between | Value to which test voltage is gradually increased, rms, 60 Hertz |
|---|---|
| (1) and (3) | 1000 |
| (1) and (4) | 1000 |
| (2) and (3) | 1500 |
| (2) and (4) | 1500 |
| (2) and (5) | 1500 |

Section 68.306 *Hazardous Voltage Limitations*

(a) General

Under no condition of failure of registered terminal equipment or registered protective circuitry, or of equipment connected thereto, which can be conceived to occur in the handling, operation or repair of such equipment or circuitry, shall the open circuit voltage on telephone connections exceed 70 volts peak for more than one second, except for voltages for network control signaling and supervision, which, in any case, should be consistent with standards employed by the telephone companies.

(b) Connection of Non-Registered Equipment to Registered Terminal Equipment or Registered Protective Circuitry

(1) General

Leads to, or any elements [illegible] conducting path to telephone connections shall be reasonably physically separated and restrained from; not routed in the same cable as; nor use the same connector as leads or metallic paths connecting to either power connections or to non-registered equipment.

(2) Connections to Registered Terminal Equipment

The voltage measurable between tip and ring, tip and ground, and ring and ground shall not exceed 70 volts peak for more than one second, as measured across the telephone connections terminated with 1500 ohms, tip to ring, center-tapped through 1000 ohms to ground, if 120 volts rms 60Hz ac is applied between all connections to other equipment tied together (except connections to non-hazardous voltage sources) and ground.

(3) Connections to Registered Protective Circuitry

The voltage measurable between tip and ring, tip and ground, and ring and ground shall not exceed 70 volts peak for more than one second, as measured across the telephone connections terminated with 1500 ohms, tip to ring, center-tapped through 1000 ohms to ground, if either 120 or 300 volts rms 60Hz ac is applied (i) between all protective circuitry connections other than telephone connections (and connections to non-hazardous voltage sources) tied together and ground, and (ii) across all protective circuitry connections other than telephone connections (and connections to non-hazardous voltage sources) which have a transmission path to the telephone connections, with alternate leads grounded, under all reasonable applications of earth ground to the protective circuitry.

(4) Non-hazardous Voltage Source

A voltage source is considered a non-hazardous voltage source if it conforms with the requirements of Sections 68.302, 68.304, and 68.306(b)(1), with all connections to the source other than primary power connections treated as "telephone

connections," and if such source supplies voltages no greater than the following under all modes of operation and of failure:

(i) ac voltages less than 42 volts peak;

(ii) dc voltages less than 80 volts; and

(iii) combined ac and dc voltages with the dc component between 21 and 80 volts, ac voltages less than $(55 - 0.6 \times V_{dc})$ peak.

Section 68.308 *Signal Power Limitations*

(a) Voiceband Metallic Signal Power

(1) *Limitations on internal signal sources not intended for network control signaling contained in voice equipment.* For all operating conditions of registered terminal equipment and registered protective circuitry, the maximum power of other than live voice signals delivered to a loop simulator circuit shall not exceed −9 dB with respect to one milliwatt, when averaged over any 3-second interval.

(2) *Limitations on internal signal sources primarily intended for network control signaling contained in voice and data equipment.* For all operating conditions of registered terminal equipment and registered protective circuitry, the maximum power delivered to a loop simulator circuit shall not exceed one milliwatt when averaged over any 3-second interval, during normal usage.

(3) *One port terminal equipment with provision for through transmission from other equipment, excluding data protective circuitry.* Registered terminal equipment and registered protective circuitry shall have no adjustments that will allow net amplification to occur in the through-transmission path within the frequency range

of 200 to 4000 Hertz, when measured from a 600 ohm source into a loop simulator circuit. The net gain of such equipment shall be designed so as not to exceed 0 dB; however, the gain for any single unit of registered terminal equipment or registered protective circuitry may exceed 0 dB by as much as 1.5 dB *provided that* the net gain, averaged over all such units, is no greater than 0 dB.

(4) *Data equipment.* For data applications, registered terminal equipment and registered protective circuitry in all operating conditions (other than (2) above) shall meet one of the following limits, depending upon the type of telephone interface. The transmitted data signal power, averaged over any 3-second time interval, delivered to a loop simulator circuit, shall not exceed:

(i) A maximum level adjustable to no greater than −4 dB with respect to one milliwatt, for connection to a telephone company provided data jack. (Fixed loss loop method.)

(ii) A maximum level set by means of connection in a telephone company-provided data jack, which level can be programmed in 1 dB steps from −12 dB to −3 dB with respect to one milliwatt. (Programmed method.)

(iii) A nonadjustable level no greater than −9 dB with respect to one milliwatt for connection to a standard telephone jack.

The maximum signal power specified in (i) and (ii) above may exceed the specified maximum level by as much as 1.0 dB, *provided that* the power, averaged over all units of the equipment

complies with the specified maximum. However, in order to protect against excessive signal power on loops with low insertion loss, no manufacturing tolerance is allowed which would permit the −9 dB with respect to one milliwatt maximum specified in (iii) above to be exceeded by any units.

(b) Metallic Signal Power at Frequencies Above Voiceband

(1) *Frequency band 3995-4005 Hertz.*

(i) *Power resulting from internal signal sources contained in registered protective circuitry and registered terminal equipment (voice and data), not intended for network control signaling.* For all operating conditions of registered terminal equipment and registered protective circuitry which incorporates signal sources other than sources intended for network control signaling, the maximum power delivered by such sources in the 3995-4005 Hertz band to a loop simulator circuit, shall be 18 dB below the maximum permitted power specified in (a) above, for the 200-4000 Hertz band.

(ii) *Terminal equipment with provision for through transmission from other equipments.* The loss in any through transmission path of registered terminal equipment and registered protective circuitry at any frequency in the 600 to 4000 Hertz band shall not exceed, by more than 3 dB, the loss at any frequency in the 3995 to 4005 Hertz band, when measured into a loop simulator circuit from a source which appears as 600 ohms across tip and ring.

(2) *Frequencies above 4005 Hertz.*

(i) Registered terminal equipment and registered protective circuitry with internal signal sources not intended for network control signaling shall not exceed the following limitations at the maximum transmitted power level.

(ii) Registered terminal equipment and registered protective circuitry with provision for through transmission from other equipments shall not exceed the following limitations, with a 1000 Hertz tone applied from a 600 ohm source (or, if appropriate, a source which reflects a 600 ohm impedance across tip and ring) at the maximum level that would be applied during normal operation. Registered protective circuitry for data shall also comply with the tone level 10 dB higher than that expected during normal operation.

(iii) Voice terminal equipment containing electro-accoustic transducers for live voice input, including recording devices, shall not exceed the following limitations, with a 1000 Hertz accoustic signal applied to the electro-accoustic transducers that results in a power delivered into the 600 ohm load impedance of −13 dB with respect to one milliwatt.

| Frequency Band | Limitations on Maximum Power (dB with respect to one milliwatt) |
|---|---|
| 4005 Hz to 10 kHz | −16 |
| 10 kHz to 25 kHz | −24 |
| 25 kHz to 40 kHz | −36 |
| 40 kHz to 1 MHz | −50 |

These limitations apply in all operating states of such equipment, except during network control signaling. In the off-hook state, they apply over the range of loop current that would flow with the equipment connected to a loop simulator circuit.

(c) Longitudinal Voltage Except During Network Control Signaling

At the telephone connections of registered terminal equipment and registered protective circuitry, the longitudinal voltage shall be less than the maximum voltages listed below when measured across the specified longitudinal termination and a 600 ohm metallic termination in the states and under the conditions specified in paragraph (b) above for metallic signal power above 4005 Hertz.

| Frequency Band | Maximum Voltage (dBV)* | Longitudinal Termination Impedance (ohms) |
|---|---|---|
| 100 Hz to 4 kHz | −53 (2.2 mV) | 500 |
| 4 kHz to 10 kHz | −57 (1.4 mV) | 500 |
| 10 kHz to 25 kHz | −62 (0.80 mV) | 300 |
| 25 kHz to 40 kHz | −74 (0.20 mV) | 200 |
| 40 kHz to 1 Mhz | −80 (0.10 mV) | 200 |

(* dBV is the voltage in decibels relative to 1 volt rms.)

In the 100 to 4000 Hertz band, the −53 dBV limit applies to the longitudinal voltage that is the resultant of all the component voltages in that band after they are weighted according to the curve in Figure 68.308. The weighting curve in Figure 68.308 has an absolute gain of unity at 4000 Hertz. A circuit which provides a longitudinal termination impedance of 500 ohms is depicted in Figure 68.310(f) in the Longitu-

dinal Balance Limitations section of these Rules. The specific resistor values depicted therein should be appropriately changed to yield other Y-networks with a metallic termination of 600 ohms impedance and with the 200 and 300 ohm aggregate longitudinal termination impedances required in this section.

[Figure 68.308 Is Omitted In This Appendix]

Section 68.310 *Longitudinal Balance Limitations*

(a) *Technical Description and Application.* The metallic-to-longitudinal balance coefficient, $BALANCE_{m-l}$, is expressed as:

$$BALANCE_{m-l} = 20 \log_{10} \left| \frac{e_M}{e_L} \right|$$

where $e_L$ is the longitudinal voltage produced across a 500-ohm longitudinal termination and $e_M$ is the metallic voltage across the tip-ring interface of the input port when a voltage (at any frequency $200 < f < 4000$ Hertz) is applied from a balanced 600-ohm metallic source. The source voltage should be set such that $e_M = 0.775$ volts rms (O dBm) when a 600-ohm termination is substituted for the terminal equipment. The minimum balance coefficient shall be equalled or exceeded at all values of dc loop current that the port under test of the registered equipment is capable of drawing when attached to the loop simulator circuit specified in these Rules. A test circuit that satisfies the above conditions and may be used for measuring the metallic-to-longitudinal balance coefficient is shown in Figure 68.310(a). The minimum balance requirements specified below shall be equalled or exceeded under all reasonable conditions of the application of earth ground to the registered equipment:

| Sub-paragraph | Equipment state | Minimum balance requirement | Frequency range (Hertz) |
|---|---|---|---|
| (b) | Both on-hook and off-hook | 60 dB<br>40 dB | 200 to 1000<br>1000 to 4000 |
| (c) | on-hook | 60 dB<br>40 dB | 200 to 1000<br>1000 to 4000 |
| | off-hook | 40 dB | 200 to 4000 |
| (d) | off-hook | 40 dB | 200 to 4000 |
| (e) voice equipment | Both on-hook and off-hook | 60 dB<br>40 dB | 200 to 1000<br>1000 to 4000 |
| (e) data equipment | on-hook | 60 dB<br>40 dB | 200 to 1000<br>1000 to 4000 |
| | off-hook | 40 dB | 200 to 4000 |
| (f) | off-hook | 40 dB | 200 to 4000 |
| (g) | Both on-hook and off-hook | 60 dB<br>40 dB | 200 to 1000<br>1000 to 4000 |
| (h) | of-hook | 40 dB | 200 to 4000 |

(b) *Registered One-Port Equipment for Loop-Start. Non-data applications.* The one-port shall be driven from a 600-ohm metallic source having a 500-ohm longitudinal impedance.

(c) *Registered One-Port Equipment for Loop-Start. Data applications.* The one-port shall be driven from a 600-ohm metallic source having a 500-ohm longitudinal impedance.

(d) *Registered One-Port Equipment for Ground-Start applications.* The one-port shall be driven from a 600-ohm metallic source having a 500-ohm longitudinal impedance.

(e) *Registered Protective Circuitry For Loop Start Applications.* These criteria shall be met with either terminal of the interface to other equipment con-

nected to earth ground. The interface to other equipment shall be terminated in an impedance which will be reflected to the telephone connection as 600-ohms in the off-hook state of the registered protective circuit, and the interface should not be terminated in the on-hook state. Figure 68.310(e) shows the interface of the protective circuitry being tested and the required arrangement at the interface to other equipment.

(f) *Registered Protective Circuitry for Ground-Start Applications.* These criteria shall be met with either terminal of the interface to other equipment connected to earth ground. The interface to other equipment shall be terminated in an impedance which will be reflected to the telephone connection as 600-ohms in the off-hook state of the registered protective circuit. Figure 68.310(e) shows the interface of the protective circuitry being tested and the required arrangement at the interface to other equipment.

(g) *Registered Multi-Port Equipment for Loop Start Applications.* These criteria shall be satisfied for all ports when the ports are terminated in their appropriate networks for both their on-hook and off-hook states, as will be identified below, and when interface connections other than the ports are terminated in circuits appropriate to that interface. The minimum balance coefficients shall also be satisfied for all values of dc loop current that the registered equipment is capable of drawing through each of its ports when these ports are attached to the loop simulator circuit specified in these Rules. The port under test shall be driven from a 600-ohm metallic source having a 500-ohm longitudinal impedance. The terminations for all ports other than the particular one whose balance coefficient is being measured shall have a metallic impedance of 600 ohms and a longitudinal impedance of 500 ohms in their off-hook states, and

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they shall be unterminated in their on-hook states. Figure 68.310(g) shows this termination.

(h) *Registered Multi-Port Equipment for Ground Start Applications.* These criteria shall be satisfied for all ports when the ports are terminated in their appropriate networks for both their on-hook and off-hook states, as will be identified below, and when interface connections other than the ports are terminated in circuits appropriate to that interface. The minimum balance coefficients shall also be satisfied for all values of dc loop current that the registered equipment is capable of drawing through each of its ports when these ports are attached to the loop simulator circuit specified in these Rules. The port under test shall be driven from a 600-ohm metallic source having a 500-ohm longitudinal impedance. The terminations for all ports other than the particular one whose balance coefficient is being measured shall have a metallic impedance of 600 ohms and a longitudinal impedance of 500 ohms. in their off-hook states and they shall be unterminated in their on-hook states. Figure 68.310(g) shows this termination.

[Figures 68.310(a), (e) and (g) Are Omitted In This Appendix]

Section 68.312 *On-hook Impedance Limitations.*

(a) Limitations on individual equipment intended for parallel operation on loop-start telephone facilities, other than PBX equipment:

(1) Registered terminal equipment and registered protective circuitry shall conform to the following limitations, for each Ringing Type which is listed as part of its Ringer Equivalence:

(i) The dc resistance between tip and ring conductors, and between each of the tip and ring conductors and earth ground shall be

greater than 10 megohms for applied dc voltages not exceeding 100 volts.

(ii) The dc resistance between tip and ring conductors, and between each of the tip and ring conductors and earth ground shall be greater than 30 kilohms for applied dc voltages between 100 and 200 volts.

(iii) During the application of simulated ringing, as listed in Table I below, the total dc current, as a result of non-sinusoidal ac wave characteristics, shall not exceed 3.0 milliamperes.

(iv) During the application of simulated ringing, as listed in Table I below, the impedance between the tip and ring conductors (defined as the quotient of applied ac voltage divided by resulting true rms current) shall be greater than the value specified in Table I. Except as provided in sub-section (2) below, such impedance shall be less than 40 kilohms.

(v) During the application of simulated ringing, as listed in Table I below, the impedance between each of the tip and ring conductors and ground shall be greater than 100 kilohms.

(2) Registered terminal equipment and registered protective circuitry intended for use on facilities which always will have additional ringing detection circuitry in use at the same time such registered terminal equipment and registered protective circuitry is connected need not comply with the 40 kilohm maximum impedance specification of subsection (a)(1)(iv), above.

(b) Ringer Equivalence definition. The values of each of the parameters for which a limitation is imposed

in sub-section (a) above shall be determined for a representative unit under test. Quotients of each such value shall be formed in accordance with the following:

(1) 50 megohms divided by the minimum measured on-hook dc resistance for dc voltages not exceeding 100 volts.

(2) 150 kilohms divided by the minimum measured on-hook dc resistance for dc voltages between 100 and 200 volts.

(3) The maximum total dc current which flows during the application of simulated ringing, as a result of non-sinusoidal ac wave characteristics, as listed in Table I below, in milliamperes divided by 0.6 milliamperes.

(4) Five times the impedance limitation listed in Table I, below, divided by the minimum measured ac impedance, defined as in sub-section (a)(1)(iv) above, during the application of simulated ringing as listed in Table I.

The largest of the unitless quotients so formed followed by the Ringing Type letter indicator, representing the frequency range for which that number is valid, is the Ringer Equivalence. If Ringer Equivalence is to be stated for more than one Ringing Type, testing shall be performed at each frequency range to which Ringer Equivalence is to be determined in accordance with the above, and the largest resulting Ringer Equivalence number so determined will be associated with each Ringing Type letter designation for which it is valid.

[Table I Is Omitted In This Appendix]

Section 68.314 *Billing Protection.*

(a) *Call duration requirements on data equipment.* Registered data terminal equipment and registered pro-

tective circuitry shall comply with the following requirements when answering an incoming call, except in off-hook states in which signals are transmitted and/or received by electroacoustic transducers only:

(1) Registered Protective Circuitry.

Registered protective circuitry connected to associated data equipment shall assure that the following signal power limitations are met for at least 2 seconds after the off-hook condition is presented to the telephone network in response to an incoming call:

(i) signals that appear at the protective circuitry-telephone network interface for delivery to the telephone network shall be limited to −55 dB with respect to one milliwatt as such signals are delivered into a loop simulator circuit; and

(ii) signals that appear at the protective circuitry-associated data equipment interface for delivery to associated data equipment shall be limited as follows: for any received signal power (appearing at the protective circuitry-telephone network interface) up to 0 dB with respect to one milliwatt (at any frequency in the range of 200 to 3200 Hertz), the power of signals delivered to associated data equipment shall be no greater than the signal power that would be delivered as a result of received signal power of −55 dB with respect to one milliwatt.

(2) Registered Terminal Equipment.

Registered terminal equipment for data applications shall assure that, when an incoming tele-

phone call is answered, the answering terminal equipment prevents both transmission and reception of data for at least 2 seconds after the answering terminal equipment transfers to the off-hook condition. For the purpose of this requirement, a fixed sequence of signals that is transmitted (and originated within) and/or received by the registered terminal equipment each time it answers an incoming call shall not be considered data, provided that such signals are for one or more of the following purposes:

(i) disabling echo suppressors,

(ii) adjusting automatic equalizers and gain controls,

(iii) establishing synchronization, or

(iv) signaling the presence and if required, the mode of operation, of the data terminal at the remote end of a connection.

(b) *Voice and data equipment requirements.* Registered protective circuitry and registered terminal equipment shall comply with the following:

(1) In the on-hook state, power delivered into a loop simulator circuit shall not exceed −55 dB with respect to one milliwatt within the frequency band of 200 to 4000 Hertz. Registered protective circuitry shall additionally assure that for any input power level up to 10 dB above the maximum level that is expected under normal operation, the power delivered into the loop simulator circuit in the on-hook state does not exceed the above limits.

(2) The loop current through registered terminal equipment or registered protective circuitry, when connected to a loop simulator circuit with the 600-ohm resistor and 500 microfarad capaci-

tor therein disconnected, shall, for at least 5 seconds after the equipment goes to the normal off-hook state which would occur in response to ringing (called party condition), not decrease by more than 25 percent from its maximum value attained during this 5-second interval, unless the equipment is returned to the on-hook state during the above 5-second interval.

(3) Registered terminal equipment and registered protective circuitry shall not deliver signals into a loop simulator circuit from sources internal to the registered equipment with energy in the 2450 to 2750 Hertz band unless an at least equal amount of energy is present in the 800 to 2450 Hertz band.

SUBPART E—COMPLAINT PROCEDURES

Section 68.400 *Content*

A complaint shall be in writing and shall contain: (a) the name and address of the complainant, (b) the name (and address, if known) of the defendant against whom the complaint is made, (c) a complete statement of the facts, including supporting data, where available, showing that such defendant did or omitted to do anything in contravention of Part 68 of the Commission's Rules, and (d) the relief sought.

Section 68.402 *Amended Complaints*

An amended complaint setting forth transactions, occurrences or events which have happened since the filing of the original complaint and which relate to the original cause of action may be filed with the Commission.

Section 68.404 *Number of Copies*

An original and two copies of all complaints and amended complaints shall be filed. An original and one copy of all other pleadings shall be filed.

Section 68.406 *Service*

(a) The Commission will serve a copy of any complaint or amended complaint filed with it, together with a notice of the filing of the complaint. Such notice shall call upon the defendant to satisfy or answer the complaint in writing within the time specified in said notice of complaint.

(b) All subsequent pleadings and briefs shall be served by the filing party on all other parties to the proceeding in accordance with the requirements of Section 1.47. Proof of such service shall also be made in accordance with the requirements of said section.

Section 68.408 *Answers to Compaints and Amended Complaints*

Any party upon whom a copy of a complaint or amended complaint is served under this subpart shall serve an answer within the time specified by the Commission in its notice of complaint. The answer shall advise the parties and the Commission fully and completely of the nature of the defense, and shall respond specifically to all material allegations of the complaint. In cases involving allegations of harm, the answer shall indicate what action has been taken or is proposed to be taken to stop the occurrence of such harm, both in terms of future production and with reference to articles in the possession of distributors, sellers, and users. Collateral or immaterial issues shall be avoided in answers and every effort should be made to narrow the issues. Matters alleged as affirmative defenses shall be separately stated and numbered. Any defendant failing to file and serve an answer within the time and in the manner prescribed may be deemed in default.

Section 68.410 *Replies to Answers or Amended Answers*

Within 10 days after service of an answer or an amended answer, a complainant may serve a reply which shall be responsive to matters contained in such answer or amended

answer and shall not contain new matters. Failure to reply will not be deemed an admission of any allegation contained in such answer or amended answer.

Section 68.412 *Defective Pleadings*

Any pleading filed in a complaint proceeding not in substantial conformity with the requirements of the applicable rules in this part may be dismissed.

[Subpart F, Consisting Primarily of Diagrams, Is Omitted From This Appendix]